ENROUTE
UNIT 2.1

Airspace Classification

FL 600

MSL 18,000

CLASS A

CLASS E

14,500 MSL

CLASS B

CLASS C

CLASS D

700 agl

1200 agl

Non-towered Airport

CLASS G

CLASS G

CLASS G

Airspace Classification
Class A

- **Class A: From 18,000 ft MSL to FL 600**
  - **Must operate under IFR clearance.**
  - **Airspace is not specifically charted.**

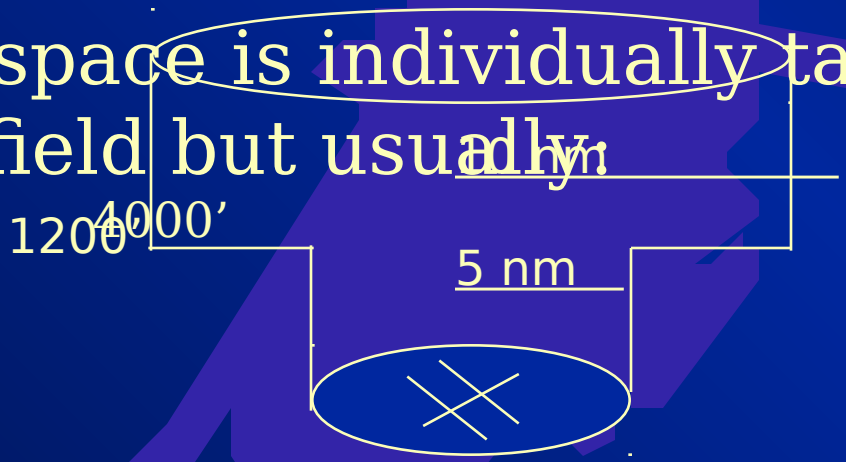
Airspace Classification
Class B

- **Class B: Generally, the configuration of airspace is individually tailored and depicted on charts around the busiest airports.**
  - **Mode C Veil: Airspace within 30 NM.**
- **Requirements:**

1. Two-way radio
2. Xponder w/ mode C
3. Operable VOR/TACAN, (IN IFR CONDITIONS)
4. Clearance prior to entry
5. At least a private license or student pilot standing.

Airspace Classification
Class C

- **Generally, surface to 4,000 ft AGL (charted in MSL) around airport with control tower, that is serviced by radar facilities.**
  - Airspace is individually tailored to airfield but usually:



Requirements

1. Two-way radio (Must est. Comm

2. Xponder mode

Airspace Classification
Class D

- **Airspace from the surface to 2,500' around airports with an operational control tower (charted in MSL).**
- **Configuration of each airspace individually tailored.**
- **Requirements:**

1. Two-way radio communications

- Contact must be established prior to entry.

Airspace Classification
Class E

- **Generally, if the airspace is not class A, B, C, or D, and it is controlled airspace, it's class E.**
- **Extends up to 18,000' from either the surface or from the top of another designated airspace.**
- **No specific requirements.**
  - Except Mode C above 10,000' MSL

Airspace Classification
Class G

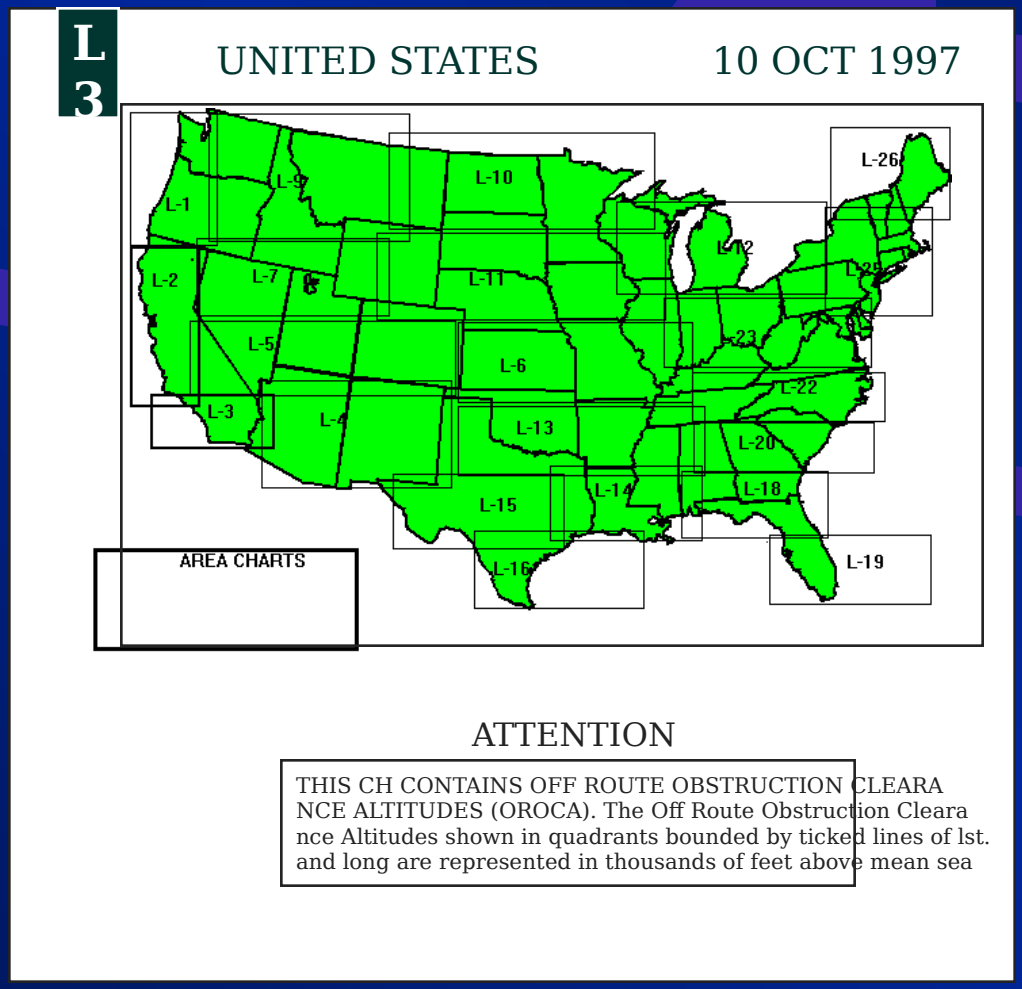
- **Uncontrolled airspace**
  - **1**,200 ft or less above the surface
  - VFR minimums and cloud clearances still apply.
  - In IFR, altitude must be 1,000’ above highest obstacle(2,000’ in mountainous) within 4 nm from the course to be flown.

Airspace Classification
TRSA

- **Terminal Radar Service Area- still in existence. Civilian participation is voluntary but military is required.**
- **Military treat a TRSA just like class C.**

IFR Enroute Low Altitude

L-3/L-4



Enroute Symbology

LEGEND

DME FIX

COMM BOX

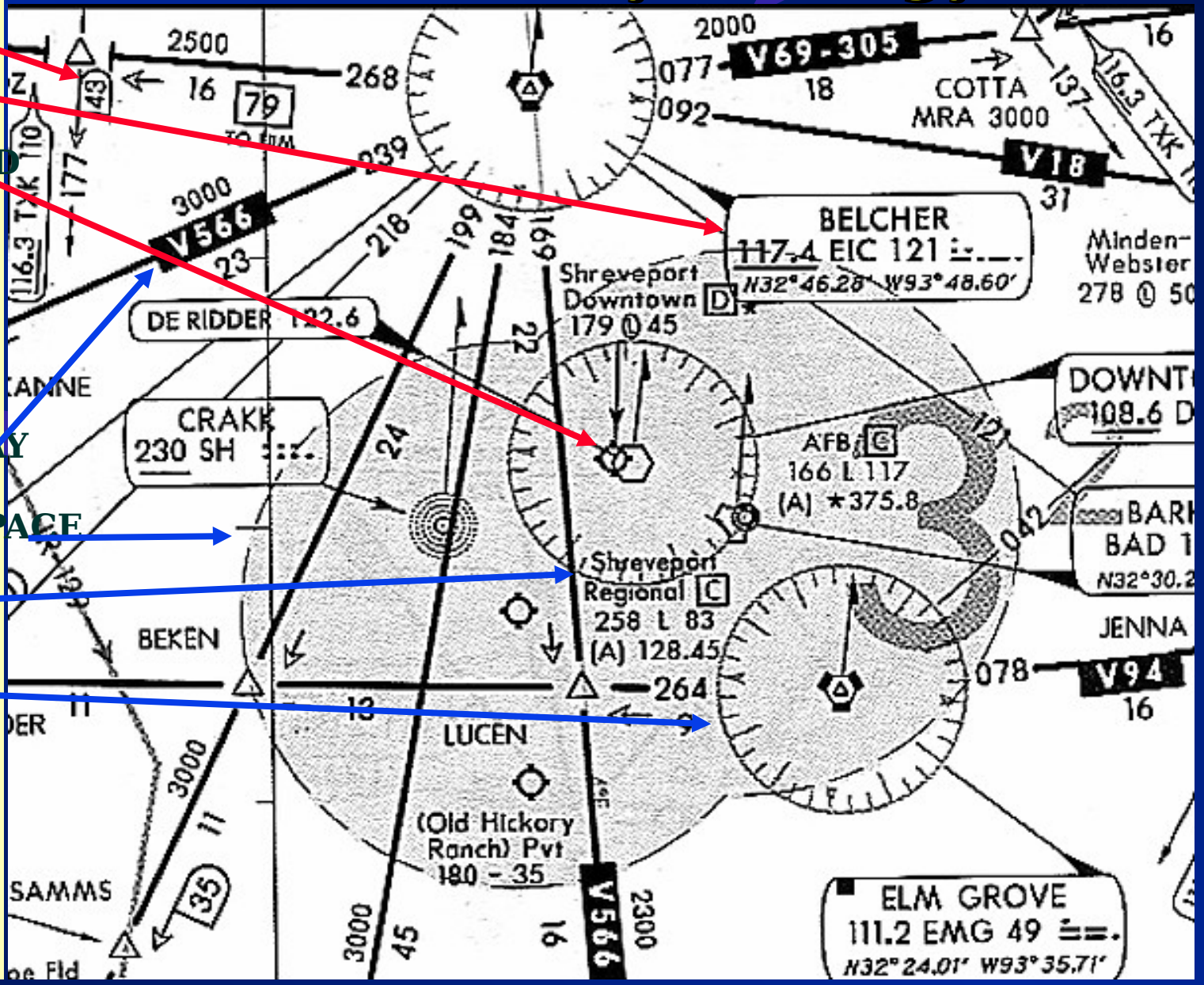
CIVIL AIRFIELD

VICTOR AIRWAY

CLASS C AIRSPACE

AIRPORT INFO

VORTAC



IFR Area Charts

Takeoff Clearance

- **Pilot’s shall read back “Position and Hold” and “Hold Short” instructions.**

Departure Instructions

- **Aircraft departing on IFR flight plans, receive clearance on designated clearance delivery or ground control frequency.**

- **Departing pilots shall read back clearances differing from filed flight plans.**

IFR Clearances

- Aircraft I.D.
- Clearance Limit
- Departure Procedure or SID
- Route of Flight
- Altitude data in order flown
- Holding Instructions
- Any Special Info
- Frequency & Beacon Info

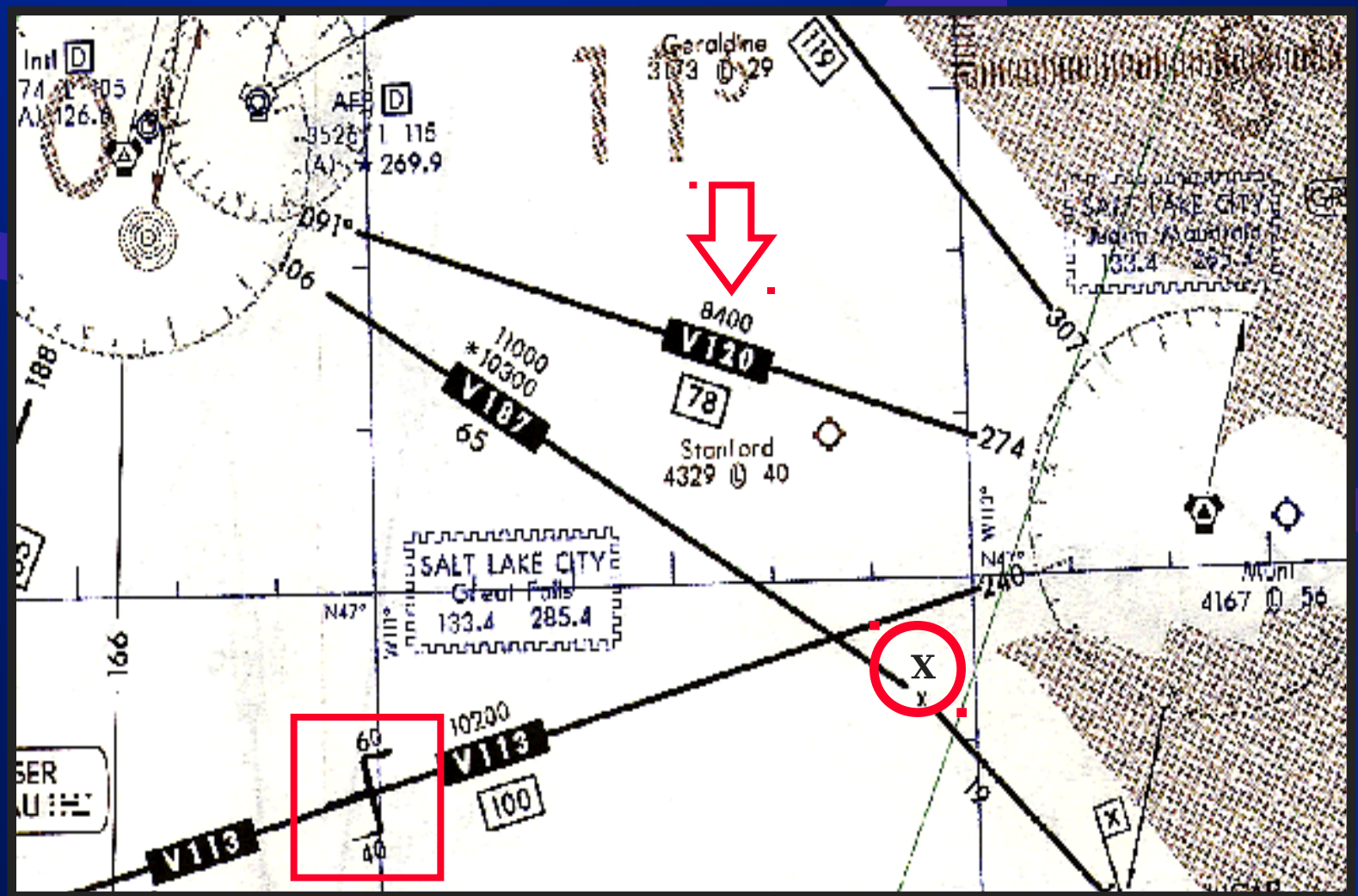
VFR ON TOP

- **ATC may authorize if:**
  - Pilot requests “VFR on TOP” or clearance to operate in VFR conditions.
- **Pilot Must:**
  - Fly VFR Altitude (Odd/Even + 500’).
  - Comply with VFR mins.
  - Comply with applicable IFR rules.
  - See and Avoid

NAVAID CHANGEOVER POINTS

- As depicted
- Greater than 6 degree bend in airway
- Halfway between radio aids

Navaid Changeover Points



Minimum IFR Altitude

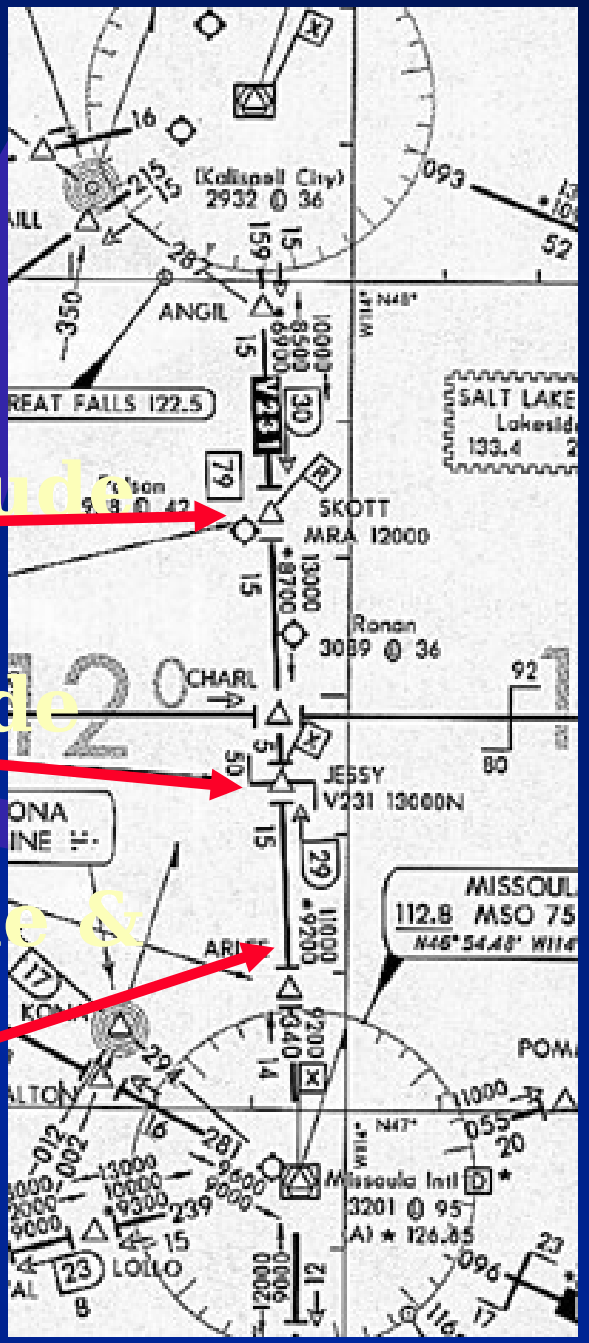
- **MEA - Minimum Enroute Altitude**
  - Lowest published altitude between radio fixes which assures NAV signal coverage, and obstacle clearance requirements between fixes.
- **MOCA - Minimum Obstruction Clearance Altitude**
  - Lowest published altitude between radio fixes on VOR airways, off airway routes or route segments.

Minimum IFR Altitude

- **MCA - Minimum Crossing Altitude**
  - Lowest altitude at certain fixes at which an aircraft must cross when proceeding towards a higher MEA.
- **MRA - Minimum Reception Altitude**
  - Lowest altitude at which an intersection can be identified.

Minimum IFR Altitude Examples

- **Minimum Reception Altitude**
- **Minimum Crossing Altitude**
- **Minimum Enroute Altitude & Minimum Obstruction Clearance Altitude (*)**



Enroute Clearances

- **Last ATC clearance has precedence over previous ATC clearance.**
  *Pilot shall not deviate from clearance unless amendment is obtained.
- **Amendments:**
  *Controllers will restate applicable altitude restrictions.
  *Immediately advise ATC if unable to comply.

Clearance Limits

- **Initial**
  - To destination airport when practicable.
- **Short Range**
  - Defined as a clearance limit differing from original flight plan.
  - Includes proposed routing beyond clearance limit if different than filed.

Short Range Clearances

- **Clearance limit on filed route**
  - EFR not required
  - EFC time not required
  - Additional clearance to proceed or hold required.
  - Clearance to proceed or hold will be issued

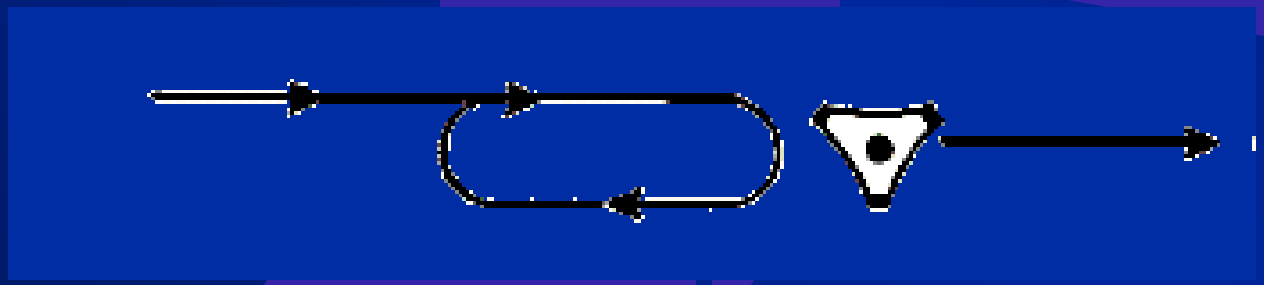
    5 minutes prior to ETA of fix.

Short Range Clearances
Cont.

- **Clearance limit off filed route**
  - Must receive EFR to:
    - Point on filed route
    - IAF to destination

HOLDING

- **Enroute Holding will usually be as depicted.**
- **Hold inbound to clearance limit in standard holding pattern unless directed otherwise.**



Holding Clearances

- **Required holding information:**
  1. Direction of holding from fix
  2. Holding fix
  3. Course, Radial, or Airway to hold on
  4. Leg length
  5. Direction of turn
  6. EFC time or expected approach time

Holding Clearances

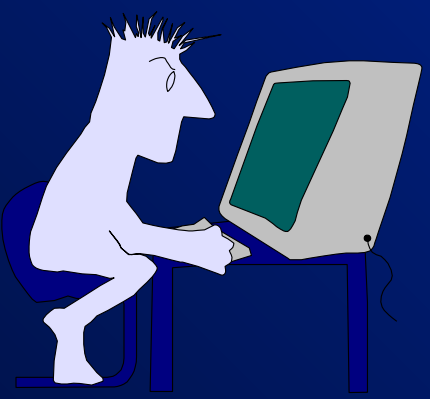
Cont..

Example: ATC requests,

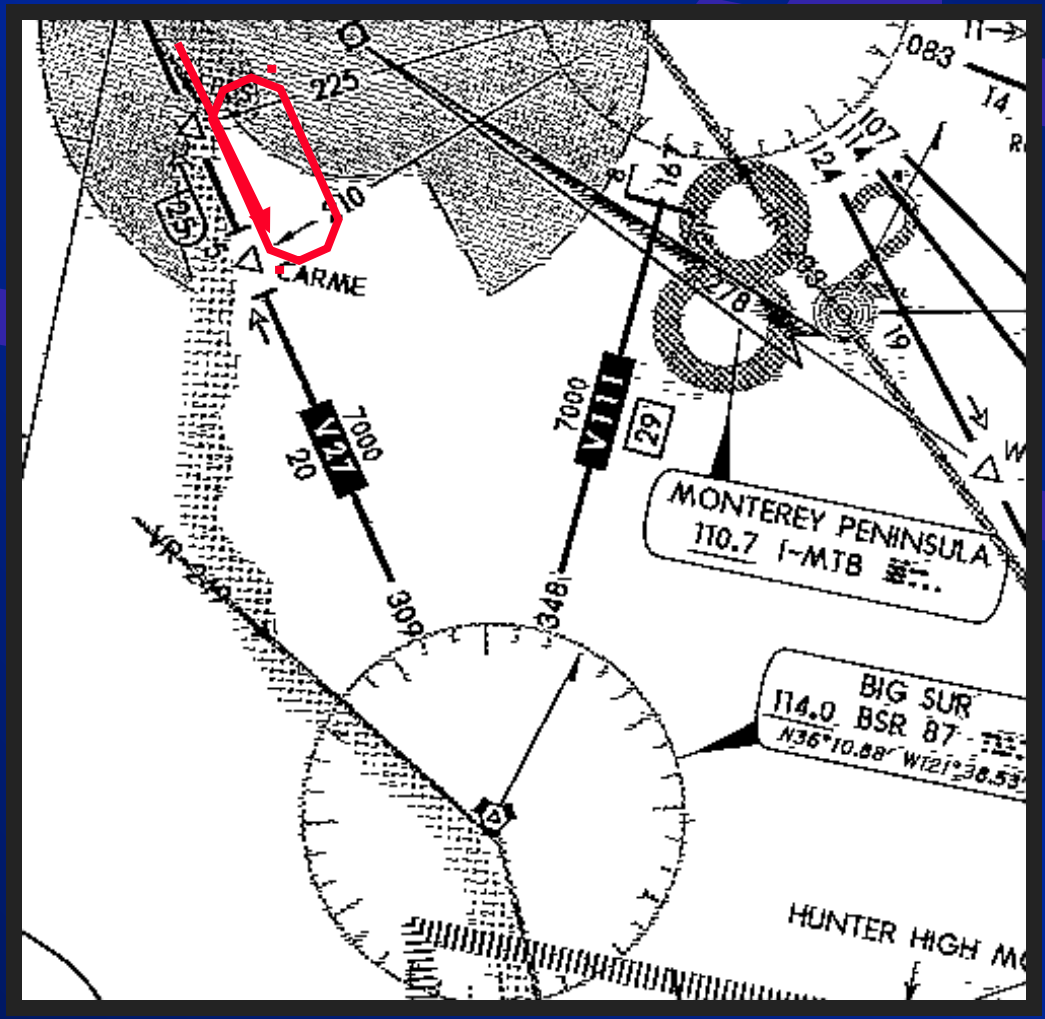
"NT 203, hold at Big Sur 309-R, 20 DME, 5 mi. legs, left hand turns EFC 0130."

Is this a valid and complete holding clearance?

NO



HOLDING EXAMPLE



ENROUTE HOLDING LOST COMM

- **Holding Clearance Received**
  - Depart holding at EFC
  - Continue along filed route of flight

- **Holding Clearance NOT Received**
  - Continue past clearance limit along filed route of flight unless otherwise directed in EFR.

COMMUNICATIONS

- **IFR RADIO DISCIPLINE**
  - Maintain a listening watch on assigned ATC freq.
  - Use flight service/military freq's for admin purposes:
    - REFILING
    - PIREPS
    - WEATHER UPDATES

REPORTING REQUIREMENTS

- **Reports to be made at all times without specific request:**
  - Leaving assigned altitude for newly assigned alt.
  - Altitude change while VFR-ON-TOP
  - Unable to climb/descend at least 500 fpm
  - Missed Approach (Request specific clearance)
  - Change in average true airspeed if it varies by 5% or 10 KTS (Whichever is greater)

any more?

REPORTING REQUIREMENTS

continued

- Time & Alt upon reaching Holding Point*
- Leaving assigned Holding Point*

  *Note: May omit at military terminal areas w/ radar.
- In controlled airspace, any comm/nav equipment failure
- Any safety of flight issues
- Wx not forecasted or affecting flight
- Any specific items requested by ATC

REPORTING REQUIREMENTS RADAR ENVIRONMENT

- **Call sign and altitude required on initial check-in with ATC.**
- **When ATC informs that aircraft is “In radar contact” pilots will discontinue position reports.**
- **Resume normal position reporting when ATC advises “Radar Contact Lost “ or Radar Services Terminated”.**

ADDITIONAL REPORTING REQUIREMENTS
NON-RADAR ENVIRONMENT

- ATC compulsory reporting points

- Point used to define a direct route/SID
- FAF
- Corrected time estimate if previous in error

  +/- 3 min

POSITION REPORTS

{PTA, PT, P}

COMPOSITION

- IDENTIFICATION
- POSITION
- TIME
- ALTITUDE
- *TYPE OF FLT PLAN
- POSITION
- TIME
- POSITION
- REMARKS

*Only Required w/ FSS

EXAMPLE

- “Calumet 610”
- “CARIF”
- “30”
- “3000”
- “IFR”
- “Oceanside”
- “40”
- “Camp Pendleton”
- As Necessary

TWO-WAY RADIO FAILURE

Pilots are expected to exercise good judgment in whatever action taken.

{FIH, A-5}

TWO-WAY RADIO FAILURE

- **If comms cannot be established during a frequency shift:**
  - Last Assigned Freq
  - Contact FSS
  - Establish Comms on Guard Freq.
    - (243.0/ 121.5/ 40.5)

- **Loss of Two-Way comms = Adjust mode 3/A transponder code to 7600**

TWO-WAY RADIO FAILURE

- **Expect ATC to respond on guard and available Navaid freq's as follows:**
  - Transponder
    - Mode 3 ident
    - With specific squawk
    - By going to stdby
  - No Transponder
    - Reply with specific maneuver, such as a turn

TWO-WAY RADIO FAILURE

- **VMC**
  - Maintain VFR and land as soon as practical
  - Close out flight plan on landing

Note: If VFR-ON-TOP and unable to maintain VFR to landing, proceed as if in IMC.

TWO-WAY RADIO FAILURE

IMC

- **IMC, Unable to get VFR, continue as follows:**

1. Route

A) As assigned in last ATC clearance

B) If radar vectored, by direct route from the point of failure to the fix or route specified in the vector clearance

C) In the absence of assigned route, the route ATC advised may be expected

D) As Filed

TWO-WAY RADIO FAILURE

IMC

2. Altitude (Highest Of:)

A) Last Assigned

B) Minimum IFR Altitude (MEA, MRA, MOCA)

C) Expected Further Clearance

Note: - Cruising Altitudes Do Not Apply

- Altitude Transitions should be executed after crossing segment fix.

TWO-WAY RADIO FAILURE

IMC

3. Departing Clearance Limit

A) If limit is a fix from which an approach can be shot, commence descent/approach at EFC, if received.

Note: If no EFC given, descend/approach at ETA or ATC amended estimate.

TWO-WAY RADIO FAILURE

IMC

3. Departing Clearance Limit (Cont'd)

B) If fix is not IAF, leave clearance limit at EFC time.

Note: If none received, upon arrival at clearance limit, continue to the IAF as close as possible to ETA or amended ETA.

TWO-WAY RADIO FAILURE

IMC

4. Radar Approaches- Initiate lost comm procedures if no transmissions received:

A) Radar vectored to final - 1 minute

B) ASR - 15 sec on final

C) PAR - 5 sec on final

TWO-WAY RADIO FAILURE

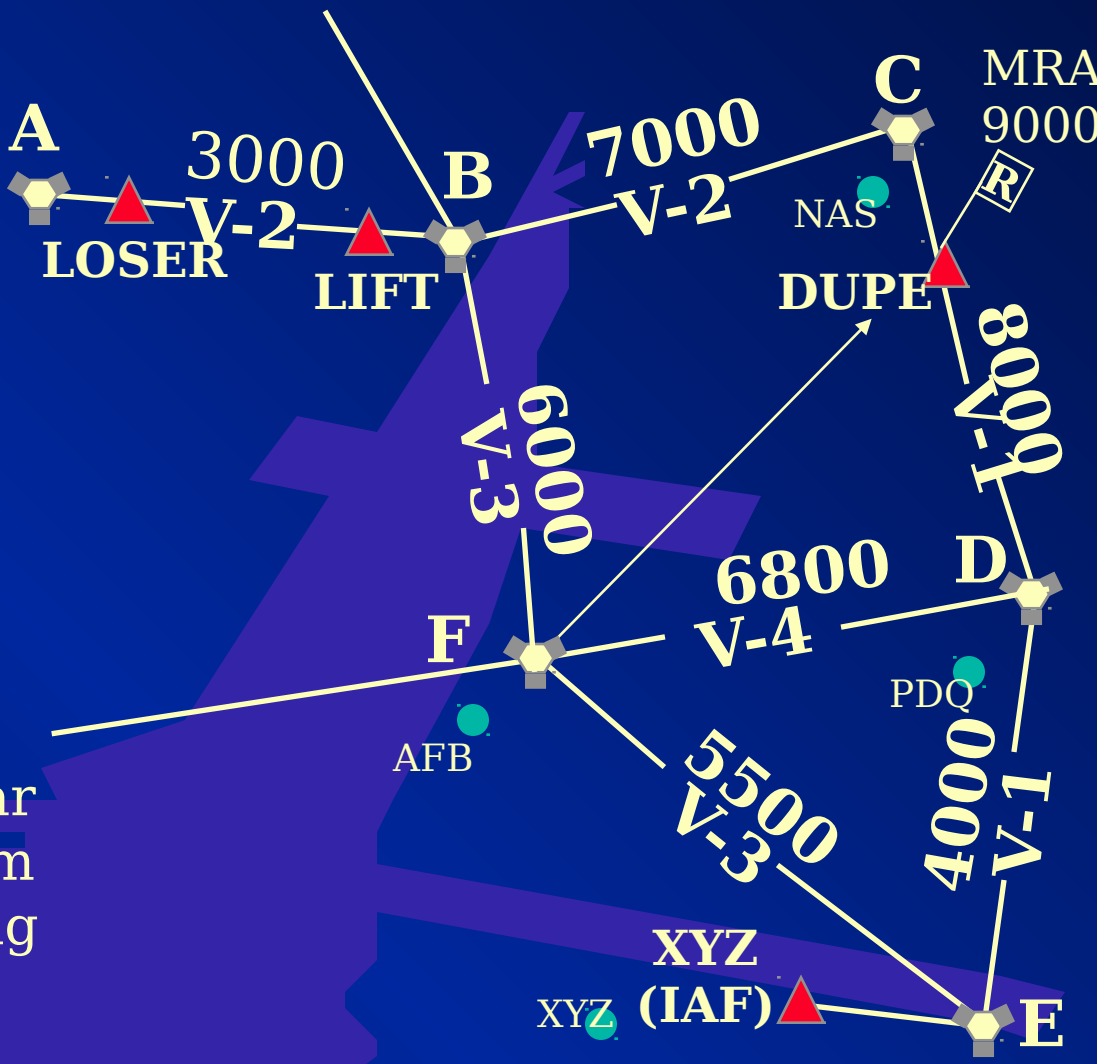
IMC

4. Radar Approaches (Cont'd)

- Attempt contact on last assigned, secondary, tower, or guard freq's.
- If comms not established and no VMC, continue with published instrument approach or with previously coordinated instructions.
- Maintain last assigned altitude or minimum safe/sector altitude, whichever is higher, until established on a published approach.

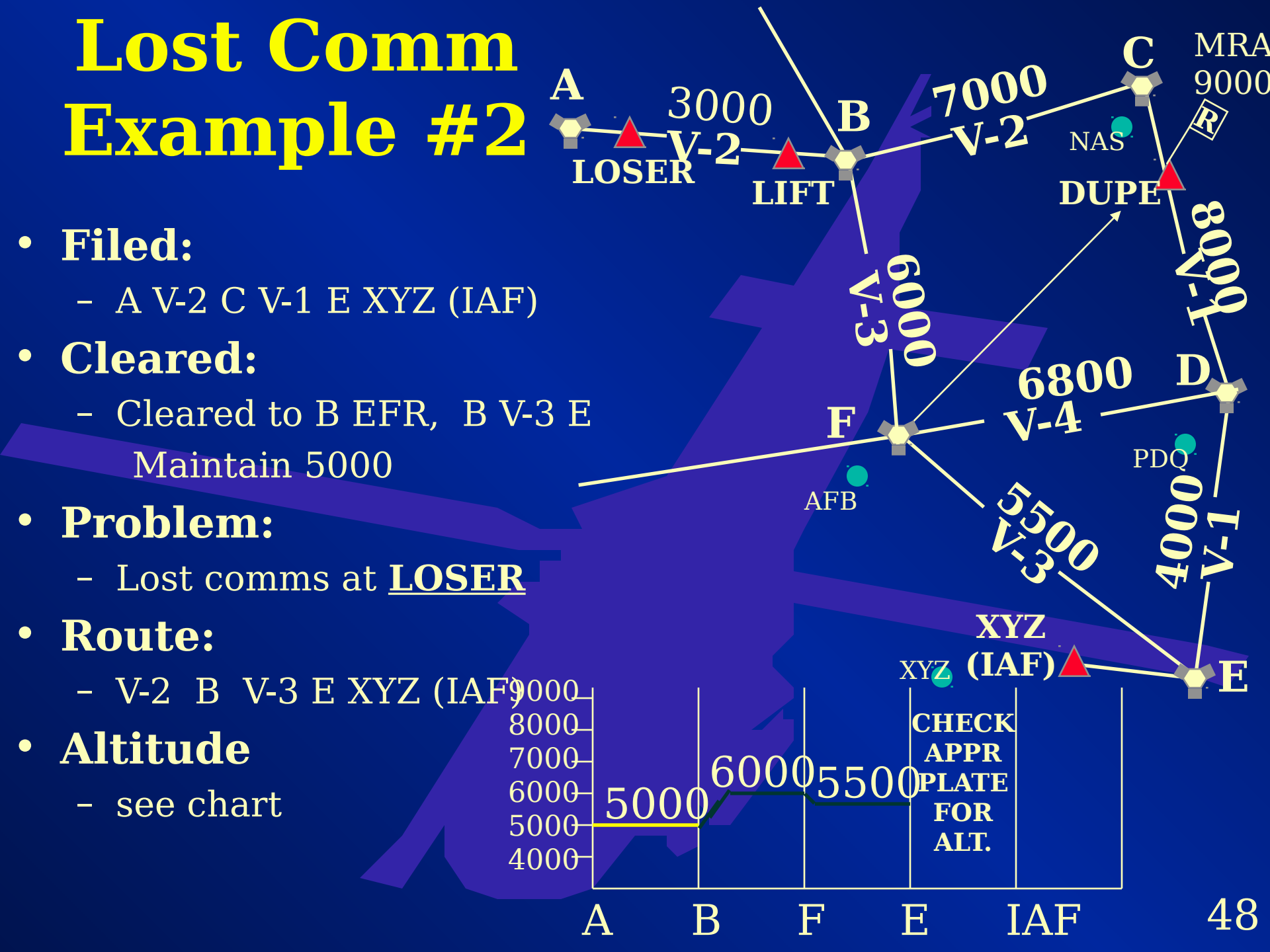
Lost Comm Example #1

- **Filed:**
  - A V-2 C V-1 E XYZ (IAF)
- **Cleared:**
  - as filed at 9000 ft
- **Problem:**
  - At B (Radar Cont.) Radar vectored to D with comm loss shortly after starting vector
- **Route:**
  - Dir D then as filed (V-1 E)
- **Altitude :**9000 ft



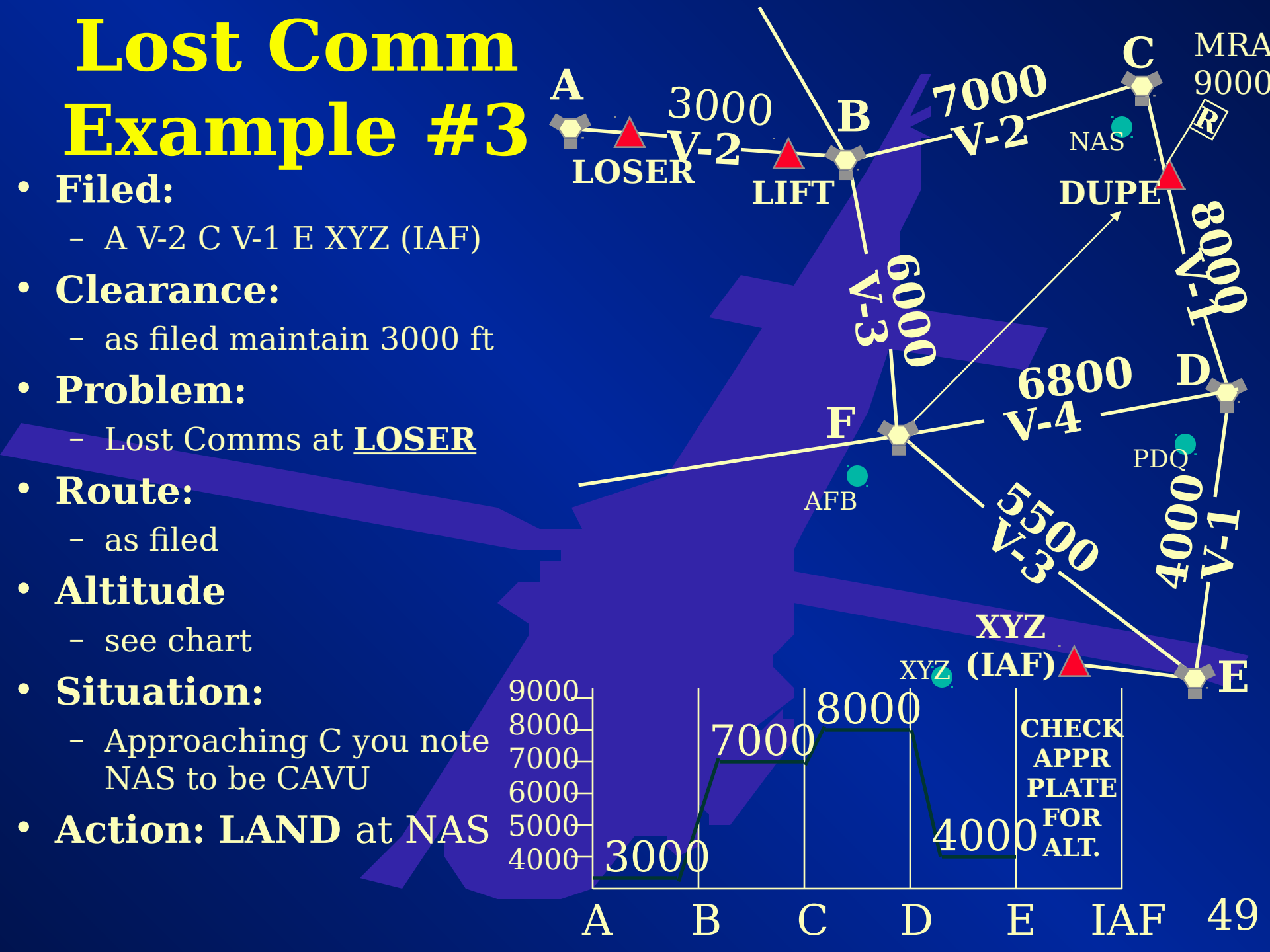
Lost Comm Example #2

- **Filed:**
  - A V-2 C V-1 E XYZ (IAF)
- **Cleared:**
  - Cleared to B EFR, B V-3 E Maintain 5000
- **Problem:**
  - Lost comms at **LOSER**
- **Route:**
  - V-2 B V-3 E XYZ (IAF)
- **Altitude**
  - see chart



Lost Comm Example #3

- **Filed:**
  - A V-2 C V-1 E XYZ (IAF)
- **Clearance:**
  - as filed maintain 3000 ft
- **Problem:**
  - Lost Comms at **LOSER**
- **Route:**
  - as filed
- **Altitude**
  - see chart
- **Situation:**
  - Approaching C you note NAS to be CAVU
- **Action: LAND** at NAS



Lost Communication Descent for Approach

Begin descent from the enroute altitude upon reaching the fix from which the approach begins but not before:

- The estimated time of arrival or as amended with ATC.

Missed Approach Procedures Lost Comm

1. **Route of flight**
   - The most logical route(Airways if practical).
2. **Altitude**
   - The minimum IFR altitude.
3. **Approach**
   - Any instrument approach available. To be executed upon expiration of ETE to alternate.

THE END
UNIT 2.1